

## About Los Alamos

As the senior laboratory in the DOE system, the Laboratory executes work in all of DOE's missions: national security, science, energy, and environmental management. Our contributions are part of what makes DOE a science, technology, and engineering powerhouse for the nation.

## About Chemistry Division

With five groups and a staff of nearly 300, the Chemistry Division serves the Laboratory's missions with innovative chemical science and technology for energy research, threat identification and mitigation, weapons science, health, space research, and much more.

Our capabilities are also essential for energy security, civilian-sector R&D, and industrial partnering.

We have expertise in

- Actinide chemistry
- Isotope science
- Synthetic and mechanistic chemistry
- Chemistry for measurement and detection science
- Chemistry of materials
- Data analysis and modeling for chemical sciences
- Radiochemistry and nuclear science

Over the years, many of our postdoctoral fellows have joined the Laboratory as technical staff members. Others have gone on to academic, research, national laboratory, or industrial appointments.



Work in C-CDE on how radiation effects polymers won the 2014 Defense Programs Award of Excellence. Shown here is team leader Andrea Labouriau with presenting officials from the DOE and DoD.

## Opportunities

Chemistry Division offers opportunities across the employment spectrum, from student positions, to graduate and postdoctoral fellowships, to mid-career research positions. We also have active programs in industrial partnering.

### Learn more about Chemistry Division:

<http://www.lanl.gov/org/padste/adcles/chemistry/>

Chemical Diagnostics and Engineering group office:  
(505) 667-5740

Chemistry Division Office: (505) 667-4457

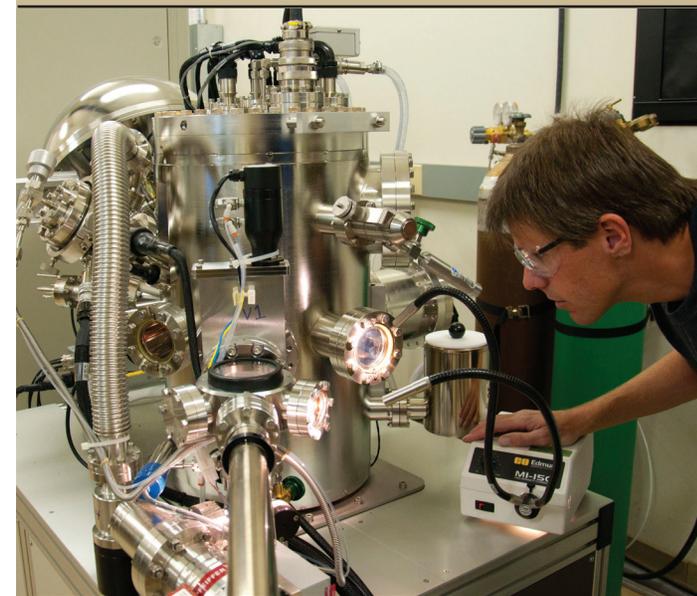
Cover: The Materials Testing Laboratory in C-CDE is home to a wide range of equipment. Shown here is a VersaProbe X-ray photoelectron spectroscopy system that provides high-sensitivity near-surface elemental and chemical bonding (valance state) analysis of solid samples.

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LA-UR-16-23595

# CHEMISTRY

## Chemical Diagnostics and Engineering (C-CDE)



C-CDE combines engineering design with routine analytical services and state-of-the-art research in analytical chemistry.

 **Los Alamos**  
NATIONAL LABORATORY

## About C-CDE

Our primary customer base comprises stockpile manufacturing R&D and surveillance; applied and basic energy sciences; threat reduction; public health; environment; and space exploration. One key aspect of the analytical chemistry effort in C-CDE is promoting close interaction between analytical chemistry and R&D programs. This connection allows our teams to benefit from the latest technological advancements and it allows our R&D efforts to focus on practical problems.

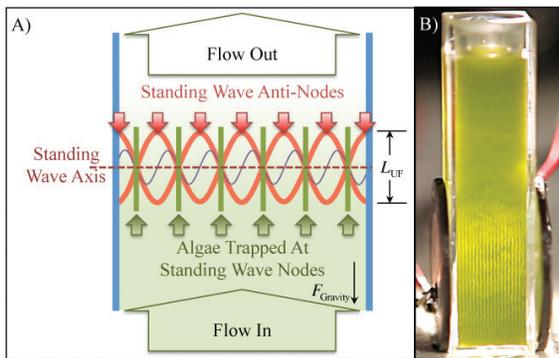
## Capabilities

### Materials Chemistry & Characterization

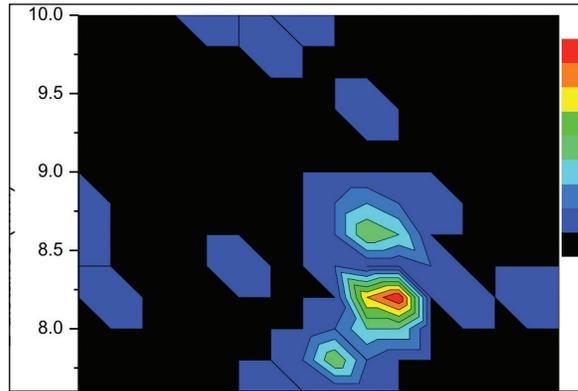
Activities use techniques such as ICPMS, XRF, EDS, FTIR, XPS, SEM, Raman, and more for projects involving chemical characterization, materials compatibility, and aging.

### Chemical Forensics and Signature Science

We conduct research and development of new instrumentation and techniques for programmatic, weapons, energy, global security, and commercial applications. Capabilities include additive manufacturing, microfluidics, stand-off detection, forensic analytical chemistry, and remote sensing.



A new algae harvesting technique uses sound waves to concentrate the algae so that they may be extracted much more efficiently from the water. This technology is being scaled up and transferred to industry.



This elemental map of plutonium distribution in a nuclear spent fuel sample containing fission product elements was made by the hiRX (high resolution X-ray) instrument developed in C-CDE.

### Elemental Analysis and Imaging

Activities involve materials characterization using nondestructive elemental analysis and spatially resolved elemental imaging with micro x-ray fluorescence; inorganic metals analysis, isotope ratio measurements, and laser ablation of solids for ultra-low detection using ICP mass spectrometry and emission spectroscopy; and field portable instrumentation for global security and industrial applications.

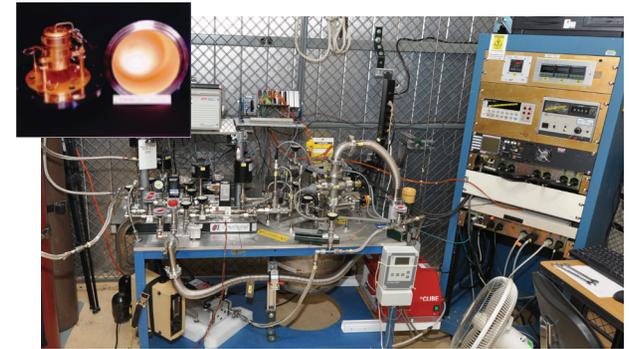
### Applied Technology & Energy

Process improvement and pollution prevention studies benefit biofuel production from non-standard feedstocks or atypical water sources for algal cultivation, novel wastewater treatment methods/systems; and hydronic systems chemistry and



PipeLIBS (Laser-Induced Breakdown Spectroscopy) is an elemental-analysis system developed in C-CDE that uses a laser beam to characterize chemical composition; it was a finalist for the prestigious 2014 R&D 100 Award.

engineering support for improved operation. We develop technologies for first responders and Homeland Security personnel. We research solar



A hydrogen processing lab supports tritium separations technology, Uranium storage bed experimentation, and Instrumentation for tritium quantification.

energy, thermal transport, and chem/bio decontamination.

### Gas and Organic Analysis

Gas and organic compound separation, identification and quantitative analysis by gas chromatography (GC) coupled with standard GC detectors (e.g. TCD) and/or mass spectrometry (MS), or directly by a Residual Gas Analyzer (RGA). GC analysis can be performed by tradition instrumentation or micro-GC technology with analysis times from seconds to 30 minutes. Mass spectrometry supported with either quadrupole or high resolution double focusing mass spectrometer for exact mass measurements.



C-CDE houses a facility for researching applications in supercritical CO<sub>2</sub> separations technology and high gradient